Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A1 for:

Siding

from

Plycem Costa Rica

Programme:	The International EPD® System, www.environdec.com
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General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Product category rules (PCR):	Construction Products and Construction Services 2012:01 Version 2.33
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☐ EPD process certification ☒ EPD verification
Third party verifier:	Marcel Gómez Ferrer. Marcel Gómez Consultoría Ambiental. Info@marcelgomez.com
Approved by:	The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:	☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company information

Owner of the EPD: PLYCEM Construsistemas Costa Rica S.A.

Contact: Ronald Thamez Mata. Strategic Planning Manager. rthamez@elementia.com

Description of the organization (www.plycem.com): In 1964, a company that would later become one of the most important fibre-cement manufacturer and leader of the lightweight construction in America was founded in Costa Rica. Additionally, it has business presence in more than 30 countries in the region.

Currently known as Plycem, our company has been dedicated for more than five decades to develop and improve the fibre-cement technology -of which we are the pioneers, thus constantly innovating the development of products that are characterized for offering differentiating values to any of our customers.

Plycem belongs to the Mexican consortium Elementia - a solid group publicly traded on the BMV (Mexican Stock Exchange) that includes the most important companies from the construction sector. Elementia has more than 30 production plants in the region, which manufacture fibre-cement products, cement, polyethylene, styrene, copper, and aluminium.

We promote a full portfolio of fibre-cement solutions that can be used for residential or commercial constructions, expansions, and renovations. We manufacture roof sheathing, ceilings or tiles, subfloors, walls, facades, and a wide variety of architectural products.

We offer products that comply with the most stringent international standards and certifications to guarantee maximum safety. We operate under a framework of ethics and responsibility. Additionally, we are pioneers of "responsible construction" at any level, and we offer different reference tools for those who are part of the construction decision process.

Product-related or management system-related certifications: Plycem boards are manufactured in a production plant with an integrated management system certified according to INTE/ISO 9001:2015, INTE/ISO 14001:2015 and INTE/OHSAS 18001:2009 standards. Siding boards are Type A Grade I according to the ASTM C 1186-08 standard and are certified as Category A Class 1 Level 1 according to the INTE/ISO 8336:2018 standard. The product complies with the National Technical Regulation RTCR 491:2017.

Name and location of production site(s): Plycem's production plant is located in Paraiso, Cartago, Costa Rica.

Product information

Product name: SIDING

Product identification:

Siding boards are available in 8 mm and 11 mm thickness and three versions of 14 mm thickness: Overlapped (*Traslapado*), MH Concealed Fixing (*MH Fijación oculta*) and Tongue and Groove Joint (*Machihembrado*). The commercial identifications are the following:

Product identificacion	Commercial identification
Siding 8 mm	976785 Siding JS 8 mm 189 X 2438 mm (DM) 6UP.
Siding 11 mm	960207 Siding Victorian 11 mm 185 x2438 mm 960208 Siding Victorian JS 11 mm 185 x 2438 mm
Siding 14 mm Overlapped	960170 Siding Overlapped JS 14 mm 247 x 2438 mm (DM) 5UP 960169 Siding Overlapped 14 mm 247 x 2438 mm (DM) 5UP 960175 Siding Overlapped 14 mm 307 x 2438 mm (DM) 5UP 960176 Siding Overlapped JS 14 mm 307 x 2438mm (DM) 5UP.
Siding 14 mm Concealed Fixing	974354 Siding MH Concealed Fixing 14 mm 240 x 2438 mm 5UP F/OC 974539 Siding MH Concealed Fixing 14 mm 213 x 365 7mm 5UP F/OC.
Siding 14 mm Tongue and Groove Joint	960199 Siding Tongue and Groove Joint Classic 14 mm 306,5 x 2444,5 mm 960190 Siding Tongue and Groove Joint Classic 14 mm 246,5 x 2444,5 mm 960193 Siding Tongue and Groove Joint Graphite 14mm 246,5x2444,5mm 960192 Siding Tongue and Groove Joint Cedar 14mm 246,5 x 2444,5mm

Product description:

Siding boards are used on exterior or interior walls as an architectural element in residences and institutional, industrial or commercial buildings.

Components: Portland cement, calcium carbonate, cellulosic fibers, and other minor aggregates. All of these meet the requirements of strength, safety and durability and strict environmental regulations.

Main advantages:

- Can be used on heavy duty walls.
- They are resistant to high impact.
- They can be cut, sanded, nailed, drilled and screwed with conventional tools.
- Provide insulation from noise and heat.
- They are resistant to humidity, fire and pests.

Product technical specifications:

Technical specifications	Procedure	Min. Value	Max. Value
Flexural strength (at equilibrium) (N/mm^2)	ASTM C 1186	7	
Elastic Modulus of Flexion (in equilibrium) (kN/mm^2)	ISO 8336/ASTM C 1186	1	3
Density (kg/dm^3)	ISO 8336	1,08	1,18
Humidity (%)	Own procedure	0	8
Total absorption (%)	ISO 8336		40
Cobb Surface Absorption (%)	Own procedure		25
Moisture movement (%)	ISO 8336/ ASTM C1186		0,13
Total Shrinkage (mm/m)	Own procedure		3,5
Water absorption (Karsten) (ml/24h) Exposed face	Own procedure		6
Smoke development	ASTM E-84	0	
Flame spread	ASTM E-84	0	

Product identification	8 mm boards	11 mm boards	14 mm Overlaping boards	
Nominal dimensions				
Thickness (mm)	8 ± 0,06	11,00 ± 0,06	14 ± 0,06	
Useful width (mm)	189 ± 1	175,5 ± 1	210,4 ± 1	270,4 ± 1
Length (mm)	2438 ± 2	2438 ± 2,0	2438 ± 2,0	
Weight and coverage				
Weight per unit (kg/un)	26,70	37,00	50,90	50,61
Useful coverage per unit (m^2)	2,30	2,56	2,56	5,63
Weight per coverage area (kg/m^2)	11,61	14,45	19,88	19,24

Product identification	**14 mm MH Concealed Fixing boards**		**14 mm Tongue and Groove boards**	
Nominal dimensions				
Thickness (mm)	14 ± 0,06		14 ± 0,06	
Useful width (mm)	223,5 ± 1	196,5 ± 1	240 ± 1	300 ± 1
Length (mm)	2438 ± 2	3657 ± 2	2438 ± 2	
Weight and coverage				
Weight per unit (kg/un)	50,05	66,63	50,90	50,61
Useful coverage per unit (m^2)	2,72	3,59	2,92	2,92
Weight per coverage area (kg/m^2)	18,40	18,56	17,43	17,33

UN CPC code:
Fibre-cement boards are classified CPC 37570 “Articles of asbestos-cement, cellulose fibre-cement or the like” under the UN CPC classification system v2.1.

Geographical scope:
Costa Rica, El Salvador, Nicaragua, Mexico, Brazil, Bolivia, Guatemala, Panama, Paraguay, Honduras, Belize, Aruba, Bahamas, Barbados, Bonaire, Cuba, Peru, Curaçao, Haiti, Jamaica, Puerto Rico, Dominican Republic, Saint Maarten, Trinidad & Tobago, United Kingdom, United States of America

LCA information

Declared unit: 1 tonne of fibre-cement boards / 1 m^2 of fibre-cement boards by thickness, installed.

Reference service life: The products covered by this EPD carry a 5-year limited warranty and have a service life in excess of 50 years, according to design and composition properties. These products can be used indoors and outdoors for various construction uses.

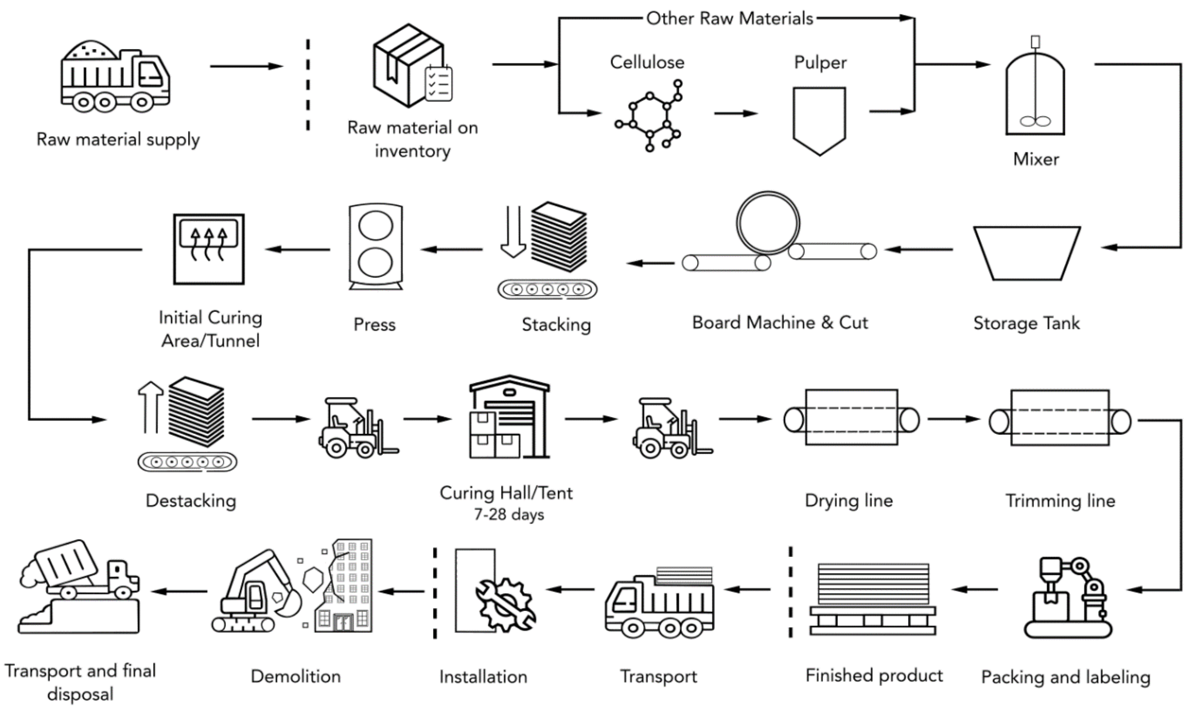
Time representativeness: The production data belongs to the period from January 1st, 2019 to December 31st, 2019. Other reference data correspond to the latest available version of Ecoinvent 3.6.

Database(s) and LCA software used: Ecoinvent 3.6 database and Open LCA database. LCA model developed in Open LCA software.

Description of system boundaries: Cradle to gate with options, including: A1-A3 + A4-A5 + B1-B7 + C1-C4

The system analysis includes all life cycle phases from raw material production to finished product at the manufacturing phase, as required by the option "cradle to gate with options" of the reference PCR. The construction phase is also included, with the transport and installation modules. The end-of-life module has been included in the analysis, while module D is declared null, since a 100% disposal scenario in landfill was considered. Environmental impacts have been evaluated considering all the phases of the product life cycle according to the rules listed in the PCR 2012:01.

System diagram:



Lifecycle stages with null impacts:

- Stage B (Use): Due to the component properties and high durability characteristics, fiber cement sheets are materials with low or no maintenance requirements. The impact of this stage is declared null.
- Stage D (Recovery): To date, the common practices do not show a potential for recovery of the product, then a 100% final disposal scenario is assumed and the impact of this stage is declared null.

Modules declared:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

X: Module declared. MND: Module not declared

- Product stage (A1-A3):
  - A1 - Supply of raw materials (upstream process): The declared fibre-cement boards consist of a core made of Portland cement, calcium carbonate, cellulose fibres, and other additives for easier processing and/or a fine adjustment of the respective properties of the individual boards. These additives add up to 2% of the overall mass of the products depending on the desired properties of the individual boards. The natural raw materials (limestone) are extracted from open-cast mining by local providers. Cellulose fibres are obtained from industrial waste paperboard and post-consumer waste newspaper. For these secondary raw materials, the polluter pays principle has been applied, so their production activities have been excluded because they belong to a previous system.
  - A2 - Transport of raw materials to production site (core process): All main raw materials are supplied by truck from local manufacturers. Limestone is extracted from mines close to the manufacturing site and cement is grinded by a local producer. Additives, fuels and packing materials are supplied regionally.
  - A3 - Manufacturing process (core process): the base materials (waste paperboard and waste newspaper) are processed to recover the cellulose fibres into a homogeneous slurry with water, and then mixed with cement and calcium carbonate. The mixture is applied to a running endless felt loop, from which part of the water is filtered through felt material. The evacuated water is returned to the process, so that waste water is significantly reduced. Layers of material are accumulated at the forming roller until the required sheet thickness is reached and the sheet is cut off. All remaining leftovers from this cutting process are returned to the manufacturing process, so that no waste is produced. The newly formed flat sheets are stacked and pressed to increase density and strength, and a first stage curing process is applied. The boards are then stored for

final curing and temporarily deposited in a storage hall. Generally, storage period lasts between one and four weeks. After the curing period, the boards are air-dried in a gas fired oven. After the drying process, the products are ready for quality control, edge trimming, cutting to pieces and packing processes.

- Finally, fibre-cement boards are stacked on reusable pallets, and packed to protect them from damage during final dispatch to customers. No packing materials are used if the final product is distributed in the local market. For regional or international shipping to clients, the fibre-cement boards are bundled and tied on reusable pallets according to the format. These pallets are usually used multiple times. Depending on the format, specific container pallets are used for overseas transport, which can be disposed of on site or recovered for further use.
- The polluter pays principle has been applied for all manufacturing waste generated in the processing plant, in such a way that the transport and final disposal processes are considered and the manager's recycling processes are excluded.

- Construction process stage (A4-A5):
    - Considering the wide distribution of the products at an international level, different means of transport are used for the delivery of the product: land freight vehicle, sea container ship and/or land freight train. Based on the distribution of sales by countries, the average distance value for each means of transport is determined, which is used in the modeling.
    - The details of the technical parameters for the transport model are obtained from the ecoinvent 3.6 database and its technical reference studies. The assumptions of this modeling are summarized below.

Parameter	Units (expressed per functional unit or per declared unit)	Value			
Vehicle type used for transport	e.g. long distance truck, boat	Lorry (diesel)	Container ship (HFO)	Train (diesel)	Train (electric)
Vehicle load capacity	metric ton per vehicle	11,56	43000	726,2	726,2
Fuel type and consumption	Litre of fuel type per km kWh per km	0,2574	84,18	6,294	23,900
Distance to central warehouse or storage, if relevant	km	N/A			
Distance to construction site	km	513,8	1073,4	0,0	0,0
Capacity utilisation (including empty returns)	%	50%	70%	40%	40%
Bulk density of transported products	kg/m^3	1130			
Volume capacity utilisation factor (factor: = 1 or < 1 or ≥ 1 for compressed or nested packaged products)	Not applicable	<1			

- Usually, the boards are factory-cut or drilled according to customer requirements by properly equipped suppliers. On the construction site, fitting cuts are possible, using suitable portable circular saws or table saws with a saw blade suitable for fibre-cement.
- These average scenarios encompass the quantity of finished product, ancillary materials for installation, power tool use, and rates of wastage of materials.
- Apart from the reusable pallets, all other packaging materials are externally recycled or disposed of. The polluter pays principle has been applied for these scenarios.
- According to the principle of modularity, the impacts of the auxiliary materials for the installation have been considered, including their production and transport to the site. Likewise, the waste of products or the generation of waste from materials was assumed

to be between 2,00% and 7,00% depending on the material and disposal to a sanitary landfill or to a recycling manager according to the classification by nature of the waste.

- The assumptions of this modeling are summarized below. Use stage (B1-B7):

<table>
<tr><th>Parameter</th><th>Units (expressed per functional unit or per declared unit)</th><th colspan="12">Value</th></tr>
<tr><td rowspan="2">Ancillary materials for installation (specified by material);</td><td>Material</td><td colspan="6">Fibrecement board</td><td colspan="6">Screws</td></tr>
<tr><td>kg</td><td colspan="6">1070</td><td colspan="6">1,18</td></tr>
<tr><td>Water use</td><td>m³</td><td colspan="12">0,00</td></tr>
<tr><td>Other resource use</td><td>kg</td><td colspan="12">0,00</td></tr>
<tr><td>Quantitative description of energy type and consumption during the preparation and installation process</td><td>kWh of electricity</td><td colspan="12">10,60</td></tr>
<tr><td>Direct emissions to ambient air, soil and water</td><td>kg</td><td colspan="12">0,00</td></tr>
<tr><td rowspan="3">Waste materials on the building site, generated by the product’s installation; specified by type</td><td>Type</td><td colspan="4">Fibrecement board</td><td colspan="4">Screws</td><td colspan="4">Packaging waste</td></tr>
<tr><td>kg</td><td colspan="4">70,0</td><td colspan="4">0,056</td><td colspan="4">17,5</td></tr>
<tr><td>% of wastage</td><td colspan="4">7,00%</td><td colspan="4">5,00%</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Output materials (specified by type) as result of waste processing at the construction site e.g. of collection for recycling, for energy recovery, disposal; specified by route</td><td>Type</td><td colspan="3">Inert waste (wastage and packaging), for final disposal</td><td colspan="3">Metal scrap (screws and strips) for recycling</td><td colspan="3">Pallet and wood waste for reuse</td><td colspan="3">Paper and cardboard waste for recycling</td></tr>
<tr><td>kg</td><td colspan="3">70,2</td><td colspan="3">0,456</td><td colspan="3">16,3</td><td colspan="3">0,595</td></tr>
<tr><td>Vehicle type used for transport specified for all waste and output material types</td><td>e.g. long distance truck, boat</td><td colspan="12">Lorry (diesel)</td></tr>
<tr><td>Vehicle load capacity</td><td>metric ton per vehicle</td><td colspan="12">11,6</td></tr>
<tr><td>Fuel type and consumption</td><td>Litre of fuel type per km</td><td colspan="12">0,257</td></tr>
<tr><td>Distance to central warehouse or storage, if relevant</td><td>km</td><td colspan="12">N/A</td></tr>
<tr><td>Distance to construction site</td><td>km</td><td colspan="12">50,0</td></tr>
<tr><td>Capacity utilisation (including empty returns)</td><td>%</td><td colspan="12">50,0%</td></tr>
<tr><td>Bulk density of transported products</td><td>kg/m³</td><td colspan="12">1130</td></tr>
<tr><td>Volume capacity utilisation factor (factor: = 1 or < 1 or ≥ 1 for compressed or nested packaged products)</td><td>Not applicable</td><td colspan="12"><1</td></tr>
</table>

- Use stage (B1-B7):
  - If used for external or internal walls, ceilings or as floor base, fibre-cement boards are commonly used with different coverings as paint, wall papers, tiles and plaster, among others. Additionally, their high strength, weather (temperature and moisture) and insect resistance properties contribute to make fibre-cement boards a durable and low or non-maintenance material.
  - During the period of use, if exposed to atmospheric conditions, the cement paste content from the fibre-cement boards reacts on the surface under the influence of CO_2 (carbon dioxide) from the air and from moisture to produce calcium carbonate (carbonation). It is assumed a scenario of application of finishes on the installed product, so the potential for carbonation in the use phase is considered negligible.

- According to the current state of knowledge, no risks for the environment are given for the intended use of the product.
- End of life stage (C1-C4):
  - Dismantling and demolition activities have been considered.
  - Road transport by truck to local waste landfill facilities has been assumed, considering an average distance of 50 km.
  - Currently, recovery practices for the reuse and recycling of fiber cement sheets are not available at the regional level, so the final disposal scenario in landfills as inert waste is determined as the one most commonly applied.
  - The assumptions of this modeling are summarized below.

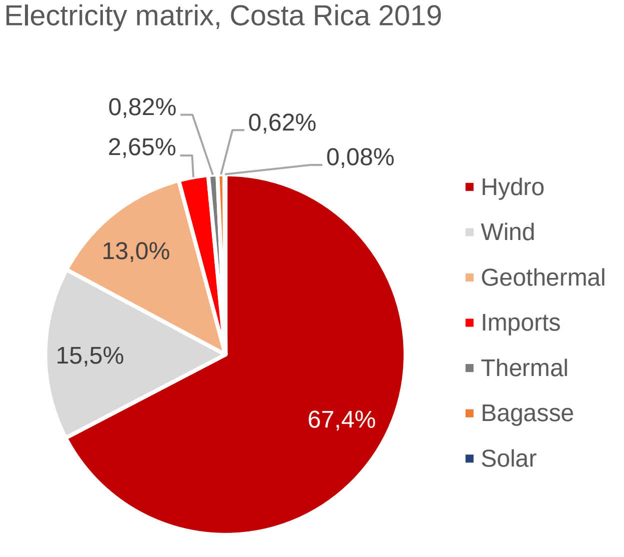
Module	Parameter	Unit (expressed per functional unit or per declared unit)	Value
C1 Deconstruction	Collection process specified by type	kg collected separately	0,00
		kg collected with mixed construction waste	1001
C2 Transport	Vehicle type used for transport specified for all waste and output material types	e.g. long distance truck, boat	Lorry (diesel)
	Vehicle load capacity	metric ton per vehicle	11,6
	Fuel type and consumption	Litre of fuel type per km	0,26
	Distance to central warehouse or storage, if relevant	km	N/A
	Distance to construction site	km	50,0
	Capacity utilisation (including empty returns)	%	50,0%
	Bulk density of transported products	kg/m^3	1100
	Volume capacity utilisation factor (factor: = 1 or < 1 or ≥ 1 for compressed or nested packaged products)	Not applicable	<1
C3 Waste processing	Recovery system specified by type	kg for re-use	0,00
		kg for recycling	0,00
		kg for energy recovery	0,00
C4 Disposal	Disposal specified by type	kg product or material for final deposition	1001

- Resource recovery stage (D):
  - A 100% landfill scenario has been considered.
  - The large-size boards can be removed non-destructively by unscrewing. If undamaged, the disassembled products could be reused according to their intended purpose.
  - Alternatively, waste fibre-cement boards may be crushed and feed as a secondary clinker raw meal component for the cement production process.
  - Since these alternatives are not widely available for the local and regional markets, only the landfill disposal scenario, as inert waste, was considered for analysis.

Other information:

- Assumptions:
  - The "primary energy used as raw material" indicators (PERM; PENRM) are calculated using - as characterization factors - published values for net calorific values of the raw materials and packaging materials.
  - The “energy used as raw material” from secondary materials was accounted as part of the total use of renewable primary energy resources according to the polluter pays principle.

  - The “primary energy as fuel” indicators (PENRE, PERE) are calculated as the total primary energy demand minus primary energy used as raw material.
  - Modules C was estimated based on default datasets for treatment of fibre-cement waste, and final disposal to landfill.
  - For the estimation of impacts from “upstream” or “downstream” contributions, when available, “Rest of the world” data sets from the ecoinvent 3.6 database were selected for the calculation of the environmental impact indicators, as there were no specific datasets available for the country or region of the production facilities.
- Cut-off rules:
  - The collected data covered all raw materials, consumables, and packaging materials; associated transport to the manufacturing site; process energy and water use; direct production wastes; emissions to air and water.
  - According to EN 15804 and the PCR, flows can be omitted (cut-off) from a core process in the LCA up to a maximum of 1% of the total mass of material inputs or 1% of the total energy content of fuels and energy carriers; various packaging materials amounting, in combination, to <0,2% of total input materials were omitted from the LCA underpinning this EPD.
  - The main materials required for the proper installation of the finished product have been considered. The materials of the support structure, which can be aluminum or wood, are excluded from this analysis.
- Data quality:
  - All data is recorded on daily basis, by production batch. Weekly, monthly and annual reporting is implemented as part of operational control. The company’s management system is certified according to ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2009 standards. All primary data was obtained directly from the company from the 2019 operating year.
  - Electricity matrix was calculated using data from the Energy Control Centre of Costa Rica from 2019 according to the distribution presented in the graph below. The associated emission factor is 0,0678 kgCO_2e / kWh.



  - Raw materials and energy consumptions are registered by automatized equipment and process.
  - In general, the data are obtained mostly from measurement data, typical of a single production site, with a temporal correlation between 3 and 10 years with respect to the data sets, with geographic correlation for a larger area with respect to the area of the

study and with a correlation with the same or similar technologies, but from a different company.

- Allocation:
  - All raw materials consumption is based on specific formulation and registered data for each product family and board type, based on its thickness and weight.
  - All energy consumption (electricity and fuels) was allocated considering registered data, reported by workplace or machine use and specific family production based on tonnage.
  - For solid waste generation, water consumption, packaging materials, boilers emissions and waste treatment plant allocation were applied based on total weight of production using each specific equipment or production phase.
  - The sales distribution data has been used to create average transport scenarios to the construction site, considering national and international sales, for each of the product families.
- Impact assessment methods
  - CML IA v 3.04-2016, EDIP and Cumulative Energy Demand
- Excluded information
  - Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI.
  - Personnel-related impacts, such as transportation to and from work, are also not accounted for in the LCIA.
- LCA practitioner:

  BIOMATEC

  - LCA conducted by Biomatech Engineering Ltda. Costa Rica
    www.biomatec.net, info@biomatec.net

Content information

Product components	Weight distribution of raw materials %[1]	Post-consumer material, weight-% of raw material	Renewable material, weight-% of raw material
Portland cement	40,0 % - 55,0 %	0,00	0,00
Calcium carbonate	35,0 % - 50,0 %	0,00	0,00
Waste Paperboard	5,00 % - 10,0 %	0,00	100 %
Waste Newspaper	< 5,00 %	77,5 %	100 %
Additives	< 5,00 %	0,00	0,00
TOTAL	100 %	1,00 %	8,62 %
Packaging materials	**Weight, kg**	**Weight-% (versus the product – 1 tonne)**	
Wood Pallet	14,9	1,49 %	
Steel strips	0,37	0,04 %	
Carboard pallet edge protector	0,33	0,03 %	
Wood, treated	0,28	0,03 %	
Polyethylene Plastic film	0,22	0,02 %	
Kraft paper	0,22	0,02 %	
TOTAL	16,4	1,64 %	

Declaration of hazardous substances: The declared products contain no or below 0,1% of hazardous substances listed on the Candidate list of Substances of Very High Concern, last updated: 18/12/2019

[1] In order to facilitate interpretation, raw materials are declared as weight-% of product mix and water is excluded due to its chemical binding in the product and humidity changes during the manufacturing stage.

Environmental Information

Results are reported separately for 1 tonne of production (declared unit) and 1 m^2 (declared unit used in design and contruction practice) of Siding fibre-cement by thickness. Modules B1-B7 and C3 are not presented in the following tables because their impacts are zero for all the impact categories reported.

Declared unit

Potential environmental impact

EMISSIONS PER ONE TONNE OF SIDING FIBRE-CEMENT BOARDS																
	Product stage			Construction process stage		Use stage							End of life stage			
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Potential environmental impact

PARAMETER	UNIT	A1+A2+A3	A4	A5	C1	C2	C4	Total
GWP	kg CO_2 eq.	6,66E+02	1,05E+02	3,86E+00	3,25E+00	8,58E+00	5,15E+00	**7,92E+02**
ODP	kg CFC 11 eq.	2,66E-03	1,86E-05	4,69E-07	5,66E-07	1,53E-06	1,74E-06	**2,68E-03**
AP	kg SO_2 eq.	1,84E+00	7,61E-01	1,89E-02	2,45E-02	4,37E-02	3,78E-02	**2,73E+00**
EP	kg PO_4^{3-} eq.	6,01E-01	1,49E-01	8,58E-03	5,73E-03	1,07E-02	8,33E-03	**7,83E-01**
POCP	kg C_2H_4 eq.	7,64E-02	2,21E-02	1,54E-03	5,45E-04	1,34E-03	1,58E-03	**1,03E-01**
ADPE	kg Sb eq.	3,64E-02	2,60E-03	1,11E-04	5,06E-06	2,29E-04	4,84E-05	**3,94E-02**
ADPF	MJ	5,40E+03	1,55E+03	4,69E+01	4,52E+01	1,28E+02	1,47E+02	**7,31E+03**
Acronyms	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources							

Use of resources

PARAMETER	UNIT	A1+A2+A3	A4	A5	C1	C2	C4	Total
PERE	MJ	1,35E+03	1,63E+01	5,38E+01	2,40E-01	1,40E+00	1,17E+00	**1,42E+03**
PERM	MJ	1,82E+03	0,00	0,00	0,00	0,00	0,00	**1,82E+03**
PERT	MJ	3,17E+03	1,63E+01	5,38E+01	2,40E-01	1,40E+00	1,17E+00	**3,25E+03**
PENRE	MJ	5,33E+03	1,53E+03	4,84E+01	4,45E+01	1,27E+02	1,45E+02	**7,23E+03**
PENRM	MJ	1,62E+02	0,00	0,00	0,00	0,00	0,00	**1,62E+02**
PENRT	MJ	5,49E+03	1,53E+03	4,84E+01	4,45E+01	1,27E+02	1,45E+02	**7,39E+03**
SM	kg	9,67E+01	0,00	0,00	0,00	0,00	0,00	**9,67E+01**
RSF	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
NRSF	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
FW	m^3	4,12E+00	1,63E-01	1,25E-01	2,33E-03	1,42E-02	1,57E-01	**4,59E+00**
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources, PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water							

Waste production and output flows

PARAMETER	UNIT	A1+A2+A3	A4	A5	C1	C2	C4	Total
HWD	kg	5,03E-02	3,86E-03	1,73E-04	1,23E-04	3,40E-04	2,20E-04	**5,50E-02**
NHWD	kg	5,64E+01	0,00	7,02E+01	0,00	0,00	1,00E+03	**1,13E+03**
RWD	kg	2,81E-02	1,03E-02	2,16E-04	3,14E-04	8,49E-04	9,68E-04	**4,08E-02**
CRU	kg	8,67E-01	0,00	1,63E+01	0,00	0,00	0,00	**1,71E+01**
MFR	kg	1,96E+00	0,00	1,06E+00	0,00	0,00	0,00	**3,01E+00**
MER	kg	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
EEE	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
EET	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EEE: Exported energy, electricity, EET: Exported energy, thermal							

Declared unit: 1 m², installed

EMISSIONS PER ONE SQUARE METER (m^2) OF SIDING FIBRE-CEMENT 8 mm BOARDS

- 976785 Siding JS 8 mm 189 X 2438 mm (DM) 6UP

	Product stage			Construction process stage		Use stage							End of life stage			
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PARAMETER		**UNIT**	**A1+A2+A3**	**A4**	**A5**	**C1**	**C2**	**C4**	**Total**
		Potential environmental impact							
Global warming potential (GWP)		kg CO_2 eq.	7,74E+00	1,22E+00	4,49E-02	3,77E-02	9,96E-02	5,98E-02	**9,20E+00**
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	3,08E-05	2,15E-07	5,44E-09	6,57E-09	1,78E-08	2,02E-08	**3,11E-05**
Acidification potential (AP)		kg SO_2 eq.	2,14E-02	8,83E-03	2,20E-04	2,85E-04	5,07E-04	4,39E-04	**3,17E-02**
Eutrophication potential (EP)		kg PO_4^{3-} eq.	6,98E-03	1,73E-03	9,96E-05	6,66E-05	1,24E-04	9,67E-05	**9,10E-03**
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	8,87E-04	2,56E-04	1,79E-05	6,33E-06	1,56E-05	1,84E-05	**1,20E-03**
Abiotic depletion potential – Elements		kg Sb eq.	4,22E-04	3,02E-05	1,29E-06	5,87E-08	2,66E-06	5,62E-07	**4,57E-04**
Abiotic depletion potential – Fossil resources		MJ	6,27E+01	1,79E+01	5,44E-01	5,25E-01	1,49E+00	1,70E+00	**8,49E+01**
		Use of resources							
Primary energy resources Renewable	Use as energy carrier	MJ	1,57E+01	1,89E-01	6,25E-01	2,79E-03	1,63E-02	1,35E-02	**1,65E+01**
	Used as raw materials	MJ	2,12E+01	0,00	0,00	0,00	0,00	0,00	**2,12E+01**
	TOTAL	MJ	3,68E+01	1,89E-01	6,25E-01	2,79E-03	1,63E-02	1,35E-02	**3,77E+01**
Primary energy resources – Non-renewable	Use as energy carrier	MJ	6,18E+01	1,78E+01	5,62E-01	5,17E-01	1,48E+00	1,69E+00	**8,39E+01**
	Used as raw materials	MJ	1,88E+00	0,00	0,00	0,00	0,00	0,00	**1,88E+00**
	TOTAL	MJ	6,37E+01	1,78E+01	5,62E-01	5,17E-01	1,48E+00	1,69E+00	**8,58E+01**
Secondary material		kg	1,12E+00	0,00	0,00	0,00	0,00	0,00	**1,12E+00**
Renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Non-renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Net use of fresh water		m^3	4,79E-02	1,89E-03	1,45E-03	2,70E-05	1,65E-04	1,83E-03	**5,32E-02**
		Waste production and output flows							
Hazardous waste disposed		kg	5,83E-04	4,49E-05	2,01E-06	1,43E-06	3,95E-06	2,56E-06	**6,38E-04**
Non-hazardous waste disposed		kg	6,55E-01	0,00	8,15E-01	0,00	0,00	1,16E+01	**1,31E+01**
Radioactive waste disposed		kg	3,27E-04	1,19E-04	2,51E-06	3,65E-06	9,85E-06	1,12E-05	**4,73E-04**
Components for reuse		kg	1,01E-02	0,00	1,89E-01	0,00	0,00	0,00	**1,99E-01**
Material for recycling		kg	2,27E-02	0,00	1,22E-02	0,00	0,00	0,00	**3,50E-02**
Materials for energy recovery		kg	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, electricity		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, thermal		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**

EMISSIONS PER ONE SQUARE METER (m^2) OF SIDING FIBRE-CEMENT 11 mm BOARDS

- 960207 Siding Victoriano 11 mm 185 x2438 mm & 960208 Siding Victoriano JS 11 mm 185 x 2438 mm

	Product stage			Construction process stage		Use stage							End of life stage			
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PARAMETER		**UNIT**	**A1+A2+A3**	**A4**	**A5**	**C1**	**C2**	**C4**	**Total**
		Potential environmental impact							
Global warming potential (GWP)		kg CO_2 eq.	9,63E+00	1,52E+00	5,58E-02	4,69E-02	1,24E-01	7,44E-02	**1,14E+01**
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	3,84E-05	2,68E-07	6,77E-09	8,18E-09	2,21E-08	2,52E-08	**3,87E-05**
Acidification potential (AP)		kg SO_2 eq.	2,67E-02	1,10E-02	2,74E-04	3,54E-04	6,31E-04	5,47E-04	**3,95E-02**
Eutrophication potential (EP)		kg PO_4^{3-} eq.	8,69E-03	2,15E-03	1,24E-04	8,29E-05	1,54E-04	1,20E-04	**1,13E-02**
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	1,10E-03	3,19E-04	2,23E-05	7,87E-06	1,94E-05	2,29E-05	**1,50E-03**
Abiotic depletion potential – Elements		kg Sb eq.	5,26E-04	3,76E-05	1,61E-06	7,31E-08	3,31E-06	6,99E-07	**5,69E-04**
Abiotic depletion potential – Fossil resources		MJ	7,80E+01	2,23E+01	6,78E-01	6,53E-01	1,85E+00	2,12E+00	**1,06E+02**
		Use of resources							
Primary energy resources Renewable	Use as energy carrier	MJ	1,95E+01	2,36E-01	7,78E-01	3,48E-03	2,03E-02	1,68E-02	**2,06E+01**
	Used as raw materials	MJ	2,63E+01	0,00	0,00	0,00	0,00	0,00	**2,63E+01**
	TOTAL	MJ	4,59E+01	2,36E-01	7,78E-01	3,48E-03	2,03E-02	1,68E-02	**4,69E+01**
Primary energy resources – Non-renewable	Use as energy carrier	MJ	7,70E+01	2,22E+01	6,99E-01	6,43E-01	1,84E+00	2,10E+00	**1,04E+02**
	Used as raw materials	MJ	2,34E+00	0,00	0,00	0,00	0,00	0,00	**2,34E+00**
	TOTAL	MJ	7,93E+01	2,22E+01	6,99E-01	6,43E-01	1,84E+00	2,10E+00	**1,07E+02**
Secondary material		kg	1,40E+00	0,00	0,00	0,00	0,00	0,00	**1,40E+00**
Renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Non-renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Net use of fresh water		m^3	5,96E-02	2,36E-03	1,81E-03	3,37E-05	2,05E-04	2,27E-03	**6,63E-02**
		Waste production and output flows							
Hazardous waste disposed		kg	7,26E-04	5,58E-05	2,50E-06	1,78E-06	4,92E-06	3,18E-06	**7,94E-04**
Non-hazardous waste disposed		kg	8,15E-01	0,00	1,01E+00	0,00	0,00	1,45E+01	**1,63E+01**
Radioactive waste disposed		kg	4,07E-04	1,49E-04	3,12E-06	4,54E-06	1,23E-05	1,40E-05	**5,89E-04**
Components for reuse		kg	1,25E-02	0,00	2,35E-01	0,00	0,00	0,00	**2,48E-01**
Material for recycling		kg	2,83E-02	0,00	1,52E-02	0,00	0,00	0,00	**4,35E-02**
Materials for energy recovery		kg	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, electricity		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, thermal		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**

EMISSIONS PER ONE SQUARE METER (m^2) OF SIDING FIBRE-CEMENT 14 mm OVERLAPPED BOARDS

- 960170 Siding Overlapped JS 14 mm 247 x 2438 mm (DM) 5UP, 960169 Siding Overlapped 14 mm 247 x 2438 mm (DM) 5UP, 960175 Siding Overlapped 14 mm 307 x 2438 mm (DM) 5UP & 960176 Siding Overlapped JS 14 mm 307 x 2438mm (DM) 5UP

	Product stage			Construction process stage		Use stage							End of life stage			
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PARAMETER		**UNIT**	**A1+A2+A3**	**A4**	**A5**	**C1**	**C2**	**C4**	**Total**
		Potential environmental impact							
Global warming potential (GWP)		kg CO_2 eq.	1,32E+01	2,09E+00	7,68E-02	6,46E-02	1,71E-01	1,02E-01	**1,58E+01**
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	5,28E-05	3,69E-07	9,32E-09	1,13E-08	3,04E-08	3,47E-08	**5,33E-05**
Acidification potential (AP)		kg SO_2 eq.	3,67E-02	1,51E-02	3,76E-04	4,88E-04	8,68E-04	7,52E-04	**5,43E-02**
Eutrophication potential (EP)		kg PO_4^{3-} eq.	1,20E-02	2,96E-03	1,71E-04	1,14E-04	2,12E-04	1,66E-04	**1,56E-02**
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	1,52E-03	4,39E-04	3,06E-05	1,08E-05	2,67E-05	3,15E-05	**2,06E-03**
Abiotic depletion potential – Elements		kg Sb eq.	7,23E-04	5,17E-05	2,21E-06	1,01E-07	4,56E-06	9,62E-07	**7,83E-04**
Abiotic depletion potential – Fossil resources		MJ	1,07E+02	3,07E+01	9,32E-01	8,99E-01	2,55E+00	2,92E+00	**1,45E+02**
		Use of resources							
Primary energy resources Renewable	Use as energy carrier	MJ	2,69E+01	3,24E-01	1,07E+00	4,78E-03	2,79E-02	2,32E-02	**2,83E+01**
	Used as raw materials	MJ	3,62E+01	0,00	0,00	0,00	0,00	0,00	**3,62E+01**
	TOTAL	MJ	6,31E+01	3,24E-01	1,07E+00	4,78E-03	2,79E-02	2,32E-02	**6,45E+01**
Primary energy resources – Non-renewable	Use as energy carrier	MJ	1,06E+02	3,05E+01	9,62E-01	8,85E-01	2,53E+00	2,89E+00	**1,44E+02**
	Used as raw materials	MJ	3,22E+00	0,00	0,00	0,00	0,00	0,00	**3,22E+00**
	TOTAL	MJ	1,09E+02	3,05E+01	9,62E-01	8,85E-01	2,53E+00	2,89E+00	**1,47E+02**
Secondary material		kg	1,92E+00	0,00	0,00	0,00	0,00	0,00	**1,92E+00**
Renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Non-renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Net use of fresh water		m^3	8,20E-02	3,24E-03	2,49E-03	4,63E-05	2,82E-04	3,13E-03	**9,12E-02**
		Waste production and output flows							
Hazardous waste disposed		kg	9,99E-04	7,68E-05	3,44E-06	2,45E-06	6,77E-06	4,38E-06	**1,09E-03**
Non-hazardous waste disposed		kg	1,12E+00	0,00	1,40E+00	0,00	0,00	1,99E+01	**2,24E+01**
Radioactive waste disposed		kg	5,60E-04	2,04E-04	4,29E-06	6,25E-06	1,69E-05	1,92E-05	**8,11E-04**
Components for reuse		kg	1,72E-02	0,00	3,24E-01	0,00	0,00	0,00	**3,41E-01**
Material for recycling		kg	3,89E-02	0,00	2,10E-02	0,00	0,00	0,00	**5,99E-02**
Materials for energy recovery		kg	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, electricity		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, thermal		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**

EMISSIONS PER ONE SQUARE METER (m^2) OF SIDING FIBRE-CEMENT 14 mm CONCEALED FIXING BOARDS

- 974354 Siding MH Concealed Fixing 14 mm 240 x 2438 mm 5UP F/OC & 974539 Siding MH Concealed Fixing 14 mm 213 x 365 7mm 5UP F/OC

	Product stage			Construction process stage		Use stage							End of life stage			
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PARAMETER		UNIT	A1+A2+A3	A4	A5	C1	C2	C4	Total
		Potential environmental impact							
Global warming potential (GWP)		kg CO_2 eq.	1,24E+01	1,95E+00	7,17E-02	6,03E-02	1,59E-01	9,56E-02	**1,47E+01**
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	4,93E-05	3,44E-07	8,70E-09	1,05E-08	2,84E-08	3,24E-08	**4,97E-05**
Acidification potential (AP)		kg SO_2 eq.	3,42E-02	1,41E-02	3,51E-04	4,55E-04	8,10E-04	7,02E-04	**5,07E-02**
Eutrophication potential (EP)		kg PO_4^{3-} eq.	1,12E-02	2,76E-03	1,59E-04	1,06E-04	1,98E-04	1,55E-04	**1,45E-02**
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	1,42E-03	4,10E-04	2,86E-05	1,01E-05	2,49E-05	2,94E-05	**1,92E-03**
Abiotic depletion potential – Elements		kg Sb eq.	6,75E-04	4,82E-05	2,07E-06	9,39E-08	4,26E-06	8,98E-07	**7,31E-04**
Abiotic depletion potential – Fossil resources		MJ	1,00E+02	2,87E+01	8,70E-01	8,39E-01	2,38E+00	2,72E+00	**1,36E+02**
		Use of resources							
Primary energy resources Renewable	Use as energy carrier	MJ	2,51E+01	3,03E-01	9,99E-01	4,46E-03	2,60E-02	2,16E-02	**2,64E+01**
	Used as raw materials	MJ	3,38E+01	0,00	0,00	0,00	0,00	0,00	**3,38E+01**
	TOTAL	MJ	5,89E+01	3,03E-01	9,99E-01	4,46E-03	2,60E-02	2,16E-02	**6,02E+01**
Primary energy resources – Non-renewable	Use as energy carrier	MJ	9,89E+01	2,85E+01	8,98E-01	8,26E-01	2,36E+00	2,70E+00	**1,34E+02**
	Used as raw materials	MJ	3,01E+00	0,00	0,00	0,00	0,00	0,00	**3,01E+00**
	TOTAL	MJ	1,02E+02	2,85E+01	8,98E-01	8,26E-01	2,36E+00	2,70E+00	**1,37E+02**
Secondary material		kg	1,80E+00	0,00	0,00	0,00	0,00	0,00	**1,80E+00**
Renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Non-renewable secondary fuels		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Net use of fresh water		m^3	7,65E-02	3,03E-03	2,32E-03	4,32E-05	2,63E-04	2,92E-03	**8,51E-02**
		Waste production and output flows							
Hazardous waste disposed		kg	9,33E-04	7,17E-05	3,21E-06	2,29E-06	6,32E-06	4,09E-06	**1,02E-03**
Non-hazardous waste disposed		kg	1,05E+00	0,00	1,30E+00	0,00	0,00	1,86E+01	**2,09E+01**
Radioactive waste disposed		kg	5,22E-04	1,91E-04	4,01E-06	5,83E-06	1,58E-05	1,80E-05	**7,57E-04**
Components for reuse		kg	1,61E-02	0,00	3,02E-01	0,00	0,00	0,00	**3,18E-01**
Material for recycling		kg	3,63E-02	0,00	1,96E-02	0,00	0,00	0,00	**5,59E-02**
Materials for energy recovery		kg	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, electricity		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, thermal		MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**

EMISSIONS PER ONE SQUARE METER (m^2) OF SIDING FIBRE-CEMENT 14 mm TONGUE AND GROOVE JOINT BOARDS

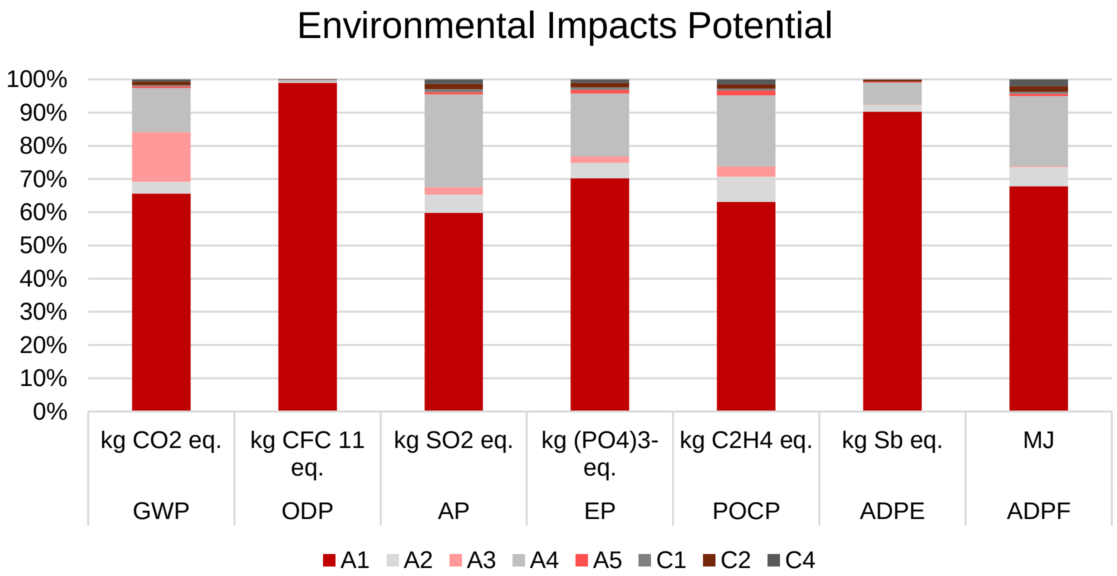
- 960199 Siding Tongue and Groove Joint Clasic 14 mm 306,5 x 2444,5 mm; 960190 Siding Tongue and Groove Joint Clasic 14 mm 246,5 x 2444,5 mm; 960193 Siding Tongue and Groove Joint Graphite 14mm 246,5x2444,5mm & 960192 Siding Tongue and Groove Joint Cedar 14mm 246,5 x 2444,5mm

	Product stage			Construction process stage		Use stage							End of life stage			
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PARAMETER	UNIT	A1+A2+A3	A4	A5	C1	C2	C4	Total
	Potential environmental impact							
Global warming potential (GWP)	kg CO_2 eq.	1,16E+01	1,83E+00	6,74E-02	5,66E-02	1,50E-01	8,98E-02	**1,38E+01**
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	4,63E-05	3,23E-07	8,17E-09	9,87E-09	2,67E-08	3,04E-08	**4,67E-05**
Acidification potential (AP)	kg SO_2 eq.	3,21E-02	1,33E-02	3,30E-04	4,27E-04	7,61E-04	6,60E-04	**4,76E-02**
Eutrophication potential (EP)	kg PO_4^{3-} eq.	1,05E-02	2,60E-03	1,49E-04	9,99E-05	1,86E-04	1,45E-04	**1,37E-02**
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	1,33E-03	3,85E-04	2,68E-05	9,50E-06	2,34E-05	2,76E-05	**1,80E-03**
Abiotic depletion potential – Elements	kg Sb eq.	6,34E-04	4,53E-05	1,94E-06	8,82E-08	4,00E-06	8,43E-07	**6,86E-04**
Abiotic depletion potential – Fossil resources	MJ	9,41E+01	2,69E+01	8,17E-01	7,88E-01	2,23E+00	2,56E+00	**1,27E+02**
	Use of resources							
Primary energy resources Renewable – Use as energy carrier	MJ	2,35E+01	2,84E-01	9,38E-01	4,19E-03	2,45E-02	2,03E-02	**2,48E+01**
Primary energy resources Renewable – Used as raw materials	MJ	3,18E+01	0,00	0,00	0,00	0,00	0,00	**3,18E+01**
Primary energy resources Renewable – TOTAL	MJ	5,53E+01	2,84E-01	9,38E-01	4,19E-03	2,45E-02	2,03E-02	**5,66E+01**
Primary energy resources – Non-renewable – Use as energy carrier	MJ	9,28E+01	2,67E+01	8,44E-01	7,76E-01	2,22E+00	2,53E+00	**1,26E+02**
Primary energy resources – Non-renewable – Used as raw materials	MJ	2,82E+00	0,00	0,00	0,00	0,00	0,00	**2,82E+00**
Primary energy resources – Non-renewable – TOTAL	MJ	9,57E+01	2,67E+01	8,44E-01	7,76E-01	2,22E+00	2,53E+00	**1,29E+02**
Secondary material	kg	1,69E+00	0,00	0,00	0,00	0,00	0,00	**1,69E+00**
Renewable secondary fuels	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Non-renewable secondary fuels	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Net use of fresh water	m^3	7,19E-02	2,84E-03	2,18E-03	4,06E-05	2,47E-04	2,74E-03	**7,99E-02**
	Waste production and output flows							
Hazardous waste disposed	kg	8,76E-04	6,74E-05	3,01E-06	2,15E-06	5,93E-06	3,84E-06	**9,58E-04**
Non-hazardous waste disposed	kg	9,83E-01	0,00	1,22E+00	0,00	0,00	1,74E+01	**1,97E+01**
Radioactive waste disposed	kg	4,91E-04	1,79E-04	3,76E-06	5,48E-06	1,48E-05	1,69E-05	**7,11E-04**
Components for reuse	kg	1,51E-02	0,00	2,84E-01	0,00	0,00	0,00	**2,99E-01**
Material for recycling	kg	3,41E-02	0,00	1,84E-02	0,00	0,00	0,00	**5,25E-02**
Materials for energy recovery	kg	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, electricity	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**
Exported energy, thermal	MJ	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**

Interpretation of Results

The environmental impact potentials and the LCIA indicators are dominated by the product stage A1-A3. Within modules A1-A3 the supply of raw materials has the highest influence, including fuels, electricity and water as raw materials, followed by the manufacturing process. The supply of cement is the most significant contributor to most impact categories. Especially the indicators ADPE and GWP result almost exclusively from the supply of cement (clinker).

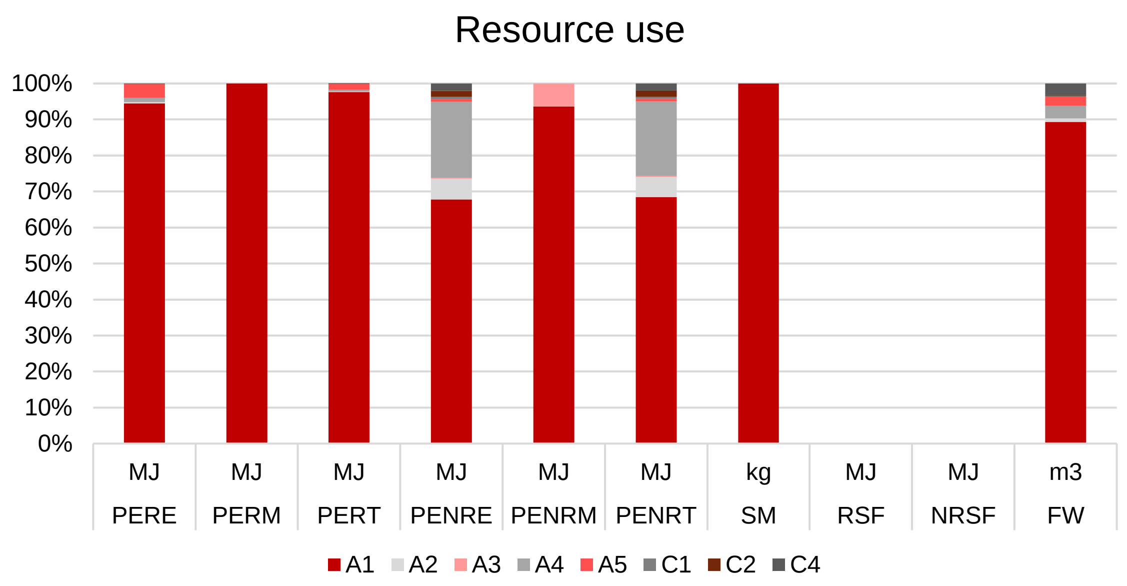


Contribution by module to the environmental impact indicators

The contribution of siloxane/silane additives used in the (pulp) slurry preparation to the ODP impact category is of relative importance. It is highlighted that no specific data was available regarding the content and ingredients of the additives used in the manufacturing process, therefore default datasets from the reference database were considered in the LCIA.

The influence of transports in A2 and C2 results mainly from the supply of diesel and the results for both modules are similar in all impact categories, with a lower impact for C2, since a road transport distance of 50 km was estimated for final disposal of wastes, while additional transport modes were considered in A2 for most raw materials used.

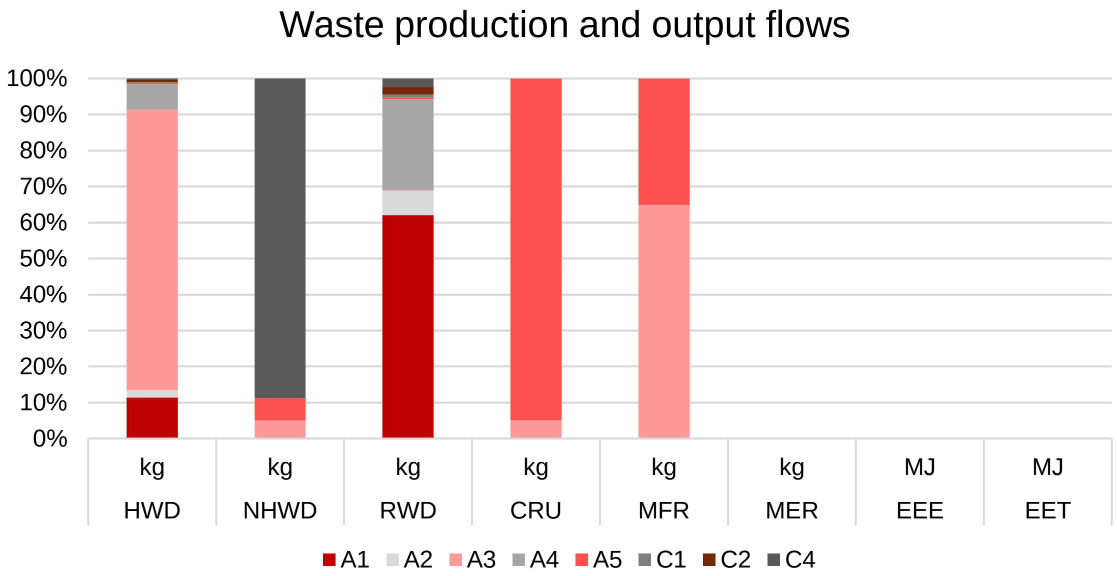
The transport in A4, from the production plant to the construction site, represents a greater impact than the other transport modules, representing more than 20% of the contribution to indicators such as AP, EP, POCP, ADPF and PENRT. This result shows the significance of the international sales distributed throughout the region.



Contribution by module to the resource use indicators

In the resource use impact categories, the Secondary Materials (SM) indicator is defined by the recovery and use of industrial waste paperboard and post-consumer waste newspaper, which contributes to reduce the renewable resources demand. Fresh water consumption is defined by direct water consumption in the manufacturing process, where a recirculation process contributes to the reduce the impact reported. This indicator has a visible contribution from the national hydropower generation, according to national electricity profile. In both cases the raw materials stage (A1) represents the main contribution.

The PERM indicator is determined by the main contribution of recovered cardboard and newspaper used as raw materials, as well as packaging materials that include wood, paper and cardboard. The PENRM indicator responds to the main contribution of diesel used as a lubricating agent in the primary production process and the contributions of additives and packaging materials. For the PENRE and PERNT indicators, in addition to the contribution of the fuels used in the production phase, the contribution of the transport modules (A2, A4 and C2) as processes with high consumption of fossil fuels stand out.



Contribution by module to the waste production and output flows indicators

The HWD and MFR indicators are defined by the generation and treatment of waste from the manufacturing stage (A3). Hazardous waste HWD indicator is associated with contaminated materials by fuels during manufacturing activities, while MFR accounts for scrap metal and other recyclable municipal waste generated on site. This last indicator has a significant contribution during construction phase (A5), under the scenario of recovery of packaging materials for recycling, which represents more than 30% of the total reported.

Specifically, CRU indicator mainly reflects the recovery of pallets for their subsequent reuse outside the production system after the installation phase (A5), with a contribution of more than 90% of the total. The contribution of pallets that come out as a donation for reuse after the production phase is secondary.

An exception from the highest contributions shown by modules A1-A3 is the indicator NHWD in which the disposal of the product waste at the end of life (C4) shows the most significant contribution in addition to the manufacturing phase (A3) and installation phase (A5), as expected.

The main contribution to the radioactive waste generation (RDW) comes from module A1, which represents about 60% of the total due to the production of fossil fuels and the use of electricity from nuclear sources. In second place comes the contribution from modules A2 and A4 related to the transport of raw materials and the finished product, these modules represent about 30% of the total due to the production of fossil fuels.

Additional information

Elementia's environmental governance

2019 was a key year for the Elementia Group's environmental management. Our sustainability strategy leads to a greater commitment and concrete actions for protecting and benefiting the environment. We made a structural change, and created the Energy and Environment Management Unit. This office reports directly to the Operations Corporate Board and it works in collaboration with Sustainability Management Office to define and execute the following environmental guidelines:

- Energy and Climate Change
- Water and Waste Management
- Product Environmental Performance

One of this year first actions was the creation of an Environmental Management System to standardize and systematize the global actions. The main system aspects are the following:

i. **Monitoring and reporting of environmental and energy indicators:** We reinforced the environmental reporting through the definition of corporate methodologies aligned with international standards and business best practices. As a result, we monitor 11 key indicators, of which 4 are part of the Balance Scorecard of our operations.

ii. **Environmental committees:** We created Operational Committees for the Environment with monthly sessions including members from our plants in Mexico and Costa Rica. The objective of these committees is to homologate environmental processes by stablishing a dialogue. This space is used to analyze and share knowledge and good practices. We identify and evaluate improvement projects in topics as water, waste, energy, and greenhouse gas emissions.

iii. **Environmental activities:** In Elementia we celebrate the World Environment Day with our employees and their families, and organize workshops with multiple topics such as water management, green contests and reforestation activities among others. In our plant in Costa Rica the project "Family Garden" allows our collaborators and their families to get involved in gardening and harvesting activities.

Energy and climate change

In 2019, we continued to execute the Elementia Energy Strategy (e3) and its concepts and guidelines were integrated with the sustainability strategy.

As a response to climate change, Elementia implemented monthly monitoring of Greenhouse gas emissions (GHG) in all its plants to stablish emission reduction projects.

This year, Plycem "Construsistemas" was recognized by the Ministry of Environment of Costa Rica for measuring and reporting our inventory of greenhouse gas emissions. This project was done as a part of the national Carbon Neutrality Program 2.0, in which Costa Rica states its intention to become a decarbonized country by 2050.

Water and waste management

i. **Water management:** In Elementia, it is fundamental to make a good use of the natural resources necessary for our operations. All of our wastewater is directly treated in our Water Treatment Plants to achieve acceptable water quality discharge standards. We use biological and physical-chemical treatment trains for wastewater. Currently, our processes run with 85% of recirculated water. We want to continue our efforts by implementing circular economy principles and replying them as best practices in all our processes.

ii. **Integral management waste:** We handle all our process outputs with strict waste prevention and management practices by implementing separation controls at different points of the waste-stream generation, for further disposal with suppliers that fulfill the country's regulations and requirements. As well, we work actively to find out the most suitable disposal methods to maximize the value of our materials, with the objective of promoting "the circular economy".

Product Environmental Performance

With the objective of reducing our operational impact, we encourage the use of recycled materials and sourcing from local suppliers. We reduced the consumption of cement and other non-renewable raw materials with the reintegration of subproducts in our process. In Costa Rica, through partnerships with local recycling companies, we ensure that all of our cellulose fibers come from pre- or post-consumer waste materials (newspaper and cardboard). This way we accomplish to replace the use of virgin cellulose by avoiding landfill disposal of local waste. In this manner, we are constantly reinforcing our commitment to reduce our environmental impact. In terms of Volatile Organic Compounds (VOC), if finishes are applied to the product on-site; the finishes must meet the VOC emissions evaluation and VOC content evaluation requirements.

Product Durability and End of Life

Plycem Construsistemas' fibre-cement boards are designed and developed with a 5-year product warranty. This product offers qualities of durability and high mechanical resistance that can offer a 50-year lifespan.

Based on the characteristics of its components (cement, inert filler minerals, organic fibers) and the design conditions of the product, the adequate separation and responsible disposal at the end of life of the product in a sanitary landfill is recommended. However, preliminary studies demonstrate a potential for the recovery and reuse of the dismantled product, and as a raw material in cement (clinker) production.

Differences versus previous versions of the EPD

This is the first version of the Siding EPD from Plycem Construsistemas Costa Rica

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